



# Reconstructing the Baths of Caracalla



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## ABSTRACT

The Baths of Caracalla are the second largest but most complete bathing complex in the city of Rome. They are a representation of the might, wealth, and ingenuity of the Roman Empire. As such, a brief introduction to the site of the Baths of Caracalla and its layout is advantageous. This article chronicles the digital reconstruction process that began as a means to obtain the geometry of one room for the purposes of a thermal analysis. Unlike many reconstructions, this one uses a parametric design program, *SolidWorks*, as the base because it allows for easy and precise manipulation of the geometry. While this recreation still has rough textures, it provides insights into the geometry: particularly surrounding the glass in the windows. The 3D model allows the viewer to partially experience the atmosphere of the site and illustrates its enormity.

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## 1. Introduction

The Baths of Caracalla in Rome, Italy were the second largest bathing complex but remain remarkably well preserved. As a mechanical engineer, I used the Baths of Caracalla as a case study to investigate the thermal environment inside the room that housed the hot baths, known as the *caldarium*. In order to complete the simulation, however, I required a geometrical model of the air volume inside the room. The way that I chose of obtaining this was to construct the room and take its interior negative. The reconstruction process was fascinating and soon enveloped the entire structure. In earlier publications (Oetelaar, 2011, 2012), I have outlined aspects of the procedure. This article builds on my previous work to provide a consolidated and complete overview. Furthermore, this journal allows for a partial exploration of the atmosphere of the Baths because of its unique inclusion of 3D models. The methodological synopsis chronicles the software programs used, the overarching issues that arose, the room specific adjustments made, the intricate insertion of window glazing, and the application of textures.

Since it is the most intact *thermae* in Rome, the Baths of Caracalla are important to reproduce accurately. As such, this reconstruction uses published publically available dimensions as much as possible. I have also undertaken a logical and precise mapping of window pane sizes not seen in other models. The biggest difference between this recreation and others is the program that I used. Parametric programs like *SolidWorks* allow for a higher degree of control of dimensions and easier modification of those dimensions. Though my recreation does

not fully capture the opulence of the Baths, it is a 3D scale model that can provide scholars measurements not available with comparative models.

## 2. Brief overview of the Baths of Caracalla

Before introducing the reconstruction process, it is important to briefly give the historical background and general layout on the Baths of Caracalla to establish some context for the site. The Romans constructed the Baths of Caracalla (formally the *Thermae Antoninianae*) between 212 CE and 216 CE and dedicated them in 216 CE. The Emperor Septimius Severus (193–211 CE) commissioned their construction but his son, Marcus Aurelius Antoninus Bassianus (popularly known as Caracalla; 211–217 CE), completed them. The baths remained in use until the Goths severed the aqueducts to Rome in 537 CE. They are located approximately 1.2 km SSE of the Flavian Amphitheatre (or Colosseum). The main building itself covers just over 2.4 ha and, with the garden and perimeter walls, the complex occupies just under 9 ha.

The layout of the Baths of Caracalla (Fig. 1) is virtually symmetrical. The alignment of the four rooms in the middle of the bath—the *natatio*, the *frigidarium*, the *tepidarium*, and the *caldarium*—comprise the axis. These four rooms represent the major bathing components of the complex. The *natatio* was a vast swimming pool (1300 m<sup>2</sup>)<sup>1</sup> originally thought to have a roof (Iwanoff and Hülsen, 1898; shown in Yegül, 1995, p. 158) but now believed to be open to the atmosphere (DeLaine, 1997). The *frigidarium* was a giant, typically high vaulted, room (1960 m<sup>2</sup>)

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<sup>1</sup> The areas given here are based off of this reconstruction.

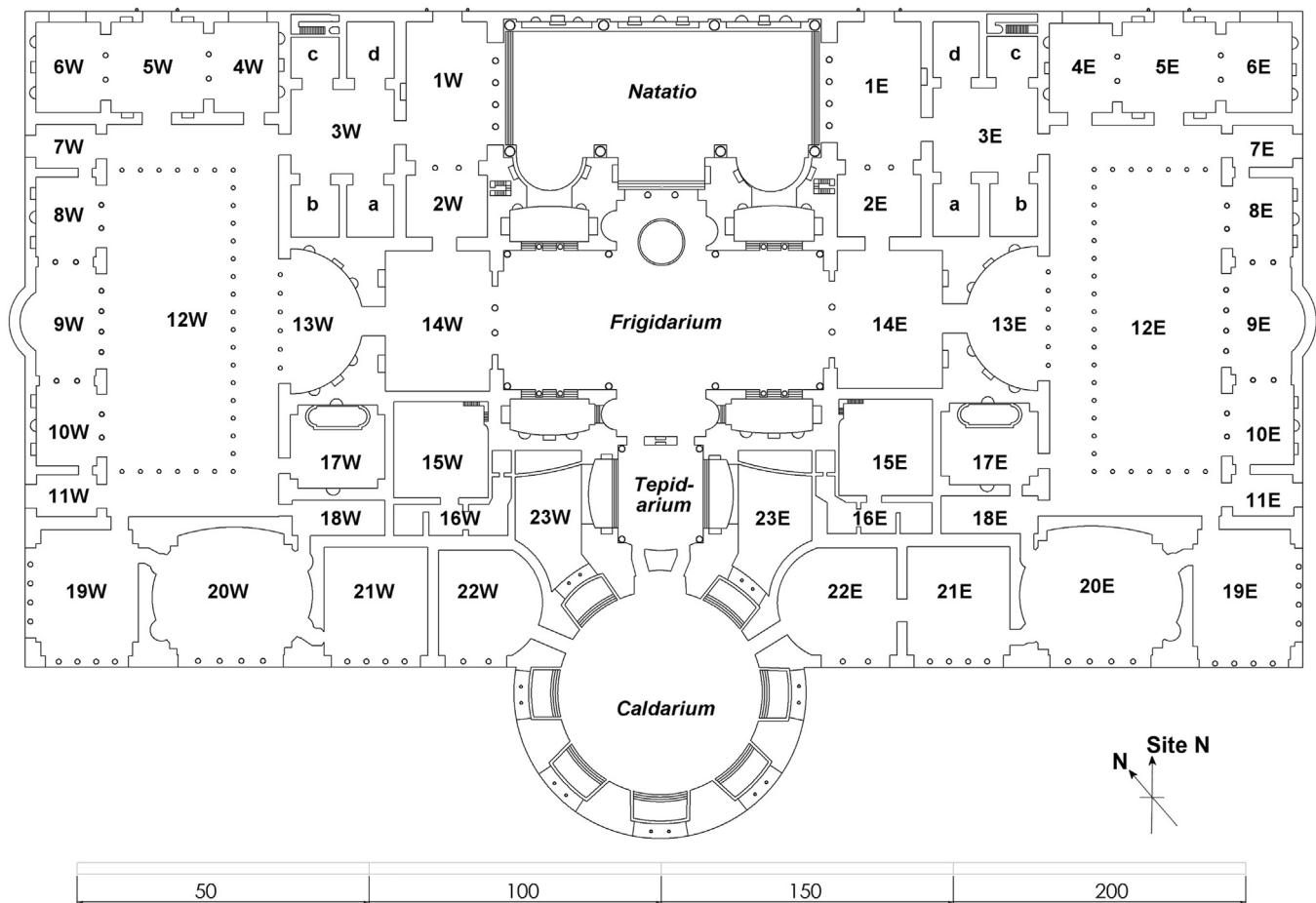


Fig. 1. Layout of the Baths of Caracalla. (Model created by Taylor Oetelaar.)

that housed the unheated baths.<sup>2</sup> The *tepidarium* was a smaller room (360 m<sup>2</sup>) containing the warm baths. The *caldarium* was another large room (1300 m<sup>2</sup>) that, as mentioned earlier, contained hot pools. The two very important off-axis rooms are 3E/W,<sup>3</sup> the *apodyteria*, and 12E/W, the *palaestrae*. The two *apodyteria* were rooms (540 m<sup>2</sup> each) where patrons changed into their bathing attire (which, many times, consisted of sandals and nothing else) and store their clothes. The two *palaestrae*, large, probably open-aided,<sup>4</sup> rooms (2000 m<sup>2</sup> each) where the patrons would exercise, represented the major sportive component of the baths.<sup>5</sup> The specific purposes of the remaining rooms are largely unknown though there are some speculations.<sup>6</sup> Rooms 19E/W–22E/W

were hot rooms since excavators found evidence of heating structures—known as the hypocaust (Yegül, 1995 provides a nice description of the hypocaust)—in them. Rooms 14E/W, 17E/W, and possibly 19E/W had smaller pools; basins sitting on the floor in the case of 14E/W and tubs approximately 0.88 m below the surface of the floor in the case of 17E/W and 19E/W.

Outside the complex there was a garden-like area surrounded by a large external wall. In this wall there were libraries, small shops, eateries, a theater, and massive cisterns that held the water for the baths. In the garden just south of the hot rooms there was an intricate network of underground passageways that slaves primarily used for the day-to-day workings of the bath, such as storing wood and boiling water for the hot baths (Piranomonte, 2008).

<sup>2</sup> The term *frigidarium* technically implies an association with cold water; however, since artificial cooling was impossible in Roman times, cold baths were simply baths with unheated water.

<sup>3</sup> I followed DeLaine's numbering scheme for the off-axis rooms as shown in Fig. 1.

<sup>4</sup> Brödner (1951) suggests that the *palaestrae* were roofed but most others (DeLaine, 1997; Yegül, 1995; Nielsen, 1993) maintain they were open-aided.

<sup>5</sup> Yegül (1995) points out when defining the *palaestrae* that this type of room used to be part of the Greek gymnasium. It is important to remember that these activities included running, boxing, wrestling, fencing, and ball games. The rooms just off the *palaestrae* at the Baths of Caracalla (i.e., 8–10E/W and particularly 13E/W given its mosaic motif, see note 20) also probably had some athletic component. The other major exercising area was the *natatio* though, as Yegül (2010) points out, because of its size and other bathers, swimming may have been limited.

<sup>6</sup> Ripostelli (1916) lists 2E/W as rooms for conversation; 8–10E/W as schools for the gymnasia; 17E/W as small *sudatoria*; 19E/W as baths for the *palaestra*; and 20E/W as open rooms for exercise. Krencker et al. (1929) specifically state that they were not trying to identify room function but they do speculate that 19E/W might have been ancillary *frigidaria*. Lugli (1970) lists 8–10E/W as schools; 14E/W as *sudatoria*; and

### 3. Software

Because of its parametric capabilities and my familiarity with it, I chose to use the engineering computer-aided design (CAD) program, Dassault Systèmes' *SolidWorks* (Dassault Systèmes, 2012), for the geometrical portion of the reconstruction. In parametric design, as the name suggests, the researcher creates features by

(footnote continued)

20E/W as halls. Nielsen (1993) lists Room 19E/W as *unctoria* or *frigidaria*, 20E/W as *tepidaria*, and 21E/W and 22E/W as *sudatoria*. DeLaine (1997) suggests that 17E/W may have been massage rooms, 20E/W were very hot, and, on page 46, she gives a schematic breakdown of the rooms (1–3E/W): dressing; 4–6E/W: entrance; 7–12E/W: *palaestra*; 13–14E/W, 17E/W: social; 15–16E/W, 18E/W, 23E/W: services; 19–22E/W: hot rooms. Piranomonte (2008) lists 1E/W as a *vestibula* and 20E/W as *lanconia*.

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